April 20, 1965 M. R. SIMMONDS 3,178,809

INSTALLATION TOOL

Original Filed Aug. 18, 1958

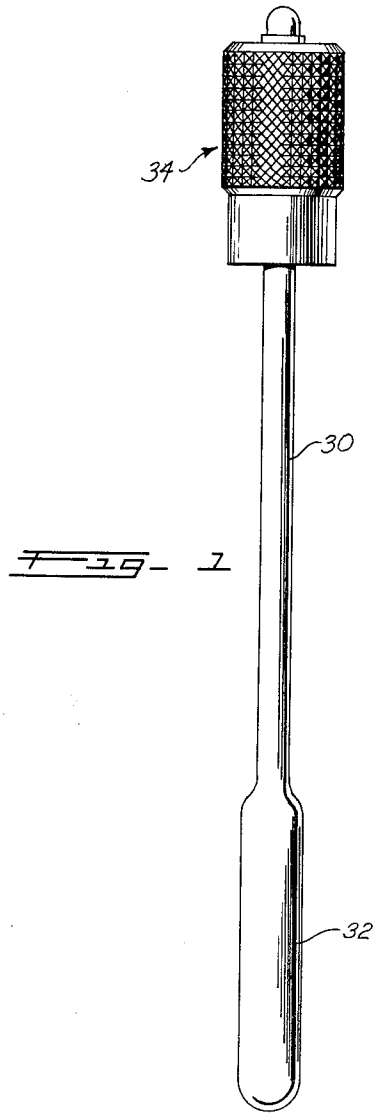

Fig. 1

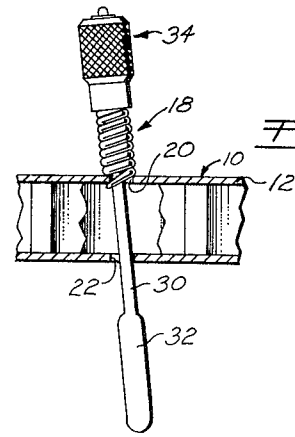

Fig. 3

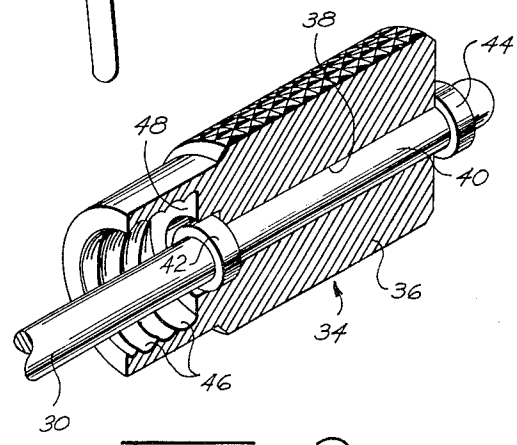

Fig. 2

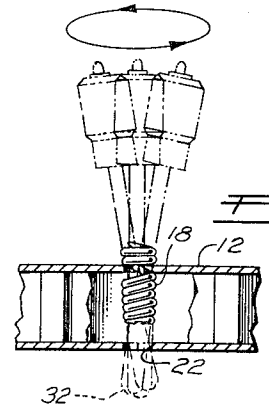

Fig. 4

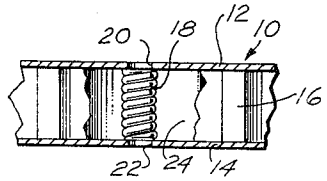

Fig. 5

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3,178,809

INSTALLATION TOOL

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Original application Aug. 18, 1958, Ser. No. 755,524, now Patent No. 3,061,054, dated Oct. 30, 1962. Divided and this application Oct. 29, 1962, Ser. No. 233,844
2 Claims. (Cl. 29—227)

This invention relates to a tool for inserting spacer members in association with structural sandwich assemblies as disclosed in my copending application Serial No. 755,524 filed August 18, 1958, now Patent No. 3,061,054 issued October 30, 1962 and of which this application is a division.

As disclosed in my above noted copending application, a spacer member of spirally wound form is disposed between the laminae of a structural sandwich member in which the laminae are spaced apart by stabilizing structure extending therebetween, the laminae being of relatively high strength in the form of skin elements whereas the stabilizing means joins such laminae and separates the same is of relatively low strength form such as a honeycomb structure but which, when integrated and joined with the skin elements, forms a relatively high strength structural sandwich.

According to the present invention, a tool is provided for inserting the spacer member into the structure after the structure has been assembled, that is in the sandwich form, and which tool is characterized by the provision of an elongate shaft of a length to completely receive the spacer member thereon for rotation about the lengthwise axis of the shaft, with a head adjacent one end of the shaft rotatable about the lengthwise axis thereof, the head having a clutching portion facing the opposite end portion of the shaft and adapted to receive one end of the spacer member and lock thereto upon rotation of the head in one direction relative to the spacing member.

Other objects and advantages of the invention will appear from the description hereinbelow and the accompanying drawing wherein:

FIG. 1 is an elevational view showing the tool according to the present invention;

FIG. 2 is an enlarged perspective view partially cutaway showing details of the internal construction at the head end of the tool;

FIGS. 3 and 4 are views showing the use of the tool; and

FIG. 5 is a view showing an insert operatively associated with the structural sandwich.

Referring at this time more particularly to FIG. 5, the purpose and function of the present tool will become more readily apparent. In this figure, a structural sandwich is indicated generally by the reference character **10** which may be seen to consist of an outer skin element **12**, an inner skin element **14** and an intervening core **16**. The core **16** serves to rigidly interconnect the two skin elements **12** and **14** and it will be appreciated that the nature of the core material **16** is generally of honeycomb form constructed of extremely thin or film-like material. Now, whereas such a construction as is illustrated in FIG. 5 cumulatively provides a structural sandwich of extreme rigidity in comparison to the weight thereof, it will also be appreciated that due to the nature of the core material **16**, which contributes materially to the lightweight construction of the sandwich, the sandwich is not well adapted to resist crushing forces which are highly localized in their application. For this reason, a reinforcing insert indicated generally by the reference character **18** is utilized between the skin elements **12** and **14** in an area thereof in which localized crushing action would occur as for example when a fastener element is adapted to be passed through the sandwich for the purpose of securing a bracket structure or the like to either face of the sandwich. It is to be appreciated that the insert **18** is not formed originally with a sandwich member but is positioned in the manner shown in FIG. 5 after the sandwich has been fabricated and after it has been determined whereat an aforementioned fastening element is desired to be placed. In placing the insert **18**, the first step is to drill completely through the structural sandwich **10** as indicated by reference characters **20** and **22** and, thereafter, a suitable tool (not shown) is used to clean out and remove the core material **16** immediately surrounding the openings **20** and **22** as is indicated by the reference character **24**, so that clearance is provided for the insertion of the insert.

All of the above forms no part of the present invention but serves merely for environmental purposes to illustrate the usefulness and purpose of the present tool. The details of the insert likewise form no part of the present invention save as to illustrate the usefulness thereof. The insert is of helical form as shown and when disposed between the two laminations or skins **12** and **14**, the coils of the insert are completely closed so that it has a solid length which is substantially equal to the spacing between the inner faces of the skin elements **12** and **14**. Thus, when a fastener such as a bolt and nut assembly is associated through the openings **20** and **22**, the localized crushing force exerted by the interengagement between the bolt and its associated nut will not locally crush the core **16** and destroy the effectiveness of the sandwich assembly **10**.

The present tool as is illustrated in FIGS. 1 and 2 is utilized for the purpose of positioning the insert **18** in a manner illustrated in FIG. 5. In FIG. 1, it will be seen that the tool comprises an elongate shank **30** having a bulbous end portion **32** and being provided at its upper end with a head assembly indicated generally by the reference character **34**. For reasons which will hereinafter more readily be apparent, the shank portion **30** is of a length exceeding that of the spacer member **18** and is also of a diameter less than the difference between the diameter of the openings **20** and **22** and the width or diameter of the spacer wire. On the other hand, the diameter of the bulbous portion **32** is less than the diameter of the holes **20** and **22** but is greater than the difference between the diameter of such openings and the width of the spacer wire. As stated, the purposes for these constructions will be hereinafter set forth.

The head assembly **34** is rotatably mounted on the shank **30** and this is clearly illustrated in FIG. 2 of the drawing. In this figure, it will be noted that the body **36** of the head assembly **34** is provided with an axial bore **38** which receives a journal portion **40** of the shank **30** and which journal portion **40** is bounded at its opposite ends by shoulder portions **42** and **44** so as to limit axial displacement between the shank **30** and the head assembly **34**. The head assembly **34** at that end thereof facing the bulbous portion **32** is provided with a counterbore which is internally threaded or grooved as indicated by reference character **46** and at the inner end of this counterbore is a downwardly facing shoulder surface **48** against which the upper end of the insert member **18** is adapted to bottom, the grooved portion **46** being of a direction and construction as to threadedly receive the upper end of the insert **18** as will be readily apparent.

When it is desired to place an insert **18** in association with the structural sandwich **10**, subsequent to the provision of the openings **20** and the enlarged portion **24**, the insert is engaged on the shank **30** and screwed into the counterbore of the head assembly **34** until the upper end thereof bottoms against the aforesaid surface **48**. At this

point, the insert will be rigid with the head assembly. The shank **30** is then inserted through the openings **20** and **22** as is illustrated in FIG. 3 and the lower end of the insert engaged so that it is disposed through the opening **20** and through the outer skin element **12**. With the parts in this position, the head assembly **34** is manually rotated so as to feed a few coils of the insert assembly **18** to the underside of the outer skin member **12**. As soon as this point is reached, the head assembly **34** is rotated in the opposite direction to unclutch the head assembly from the upper end of the insert **18**, the shank assembly is withdrawn upwardly so that the bulbous lower end portion **32** projects within the confines of the lower opening **22** but terminates short of the upper opening **20**. The tool is then imparted of a nutating motion as is illustrated in FIG. 4 which motion is achieved by describing a circle with the head assembly **34** which is of opposite direction to the direction of the threads formed by the coils of the insert **18** which will effect further feeding of the coils of the insert **18** beneath the outer skin member **12**, all as is more particularly set forth and defined in my above noted parent application.

From the above, the purpose for the above specified dimensioning of the parts **30** and **32** will become more readily apparent. Obviously, the shank **30** must be of a diameter which is less than the difference between the diameter of the openings **20** and **22** and the width or diameter of the coils of the insert **18** in order to permit of the aforesaid threading of the insert through the opening **20** by the nutating motion illustrated in FIG. 4. At the same time, the bulbous portions disposed within the confines of the opening **22** and blocks or prevents the lower end of the insert **18** from threading through such opening **22** as would be the case were not the bulbous portion of a diameter which is greater than the difference between the diameter of the opening **22** and the diameter or width of the coils or wires of the spacer member **18**.

It is to be understood that certain changes and modifications as illustrated and described may be made without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. A tool for inserting a spirally wound wire spacer member through an opening into a space between spaced apart laminae of a pre-assembled structural member, which tool comprises an elongated shaft, and a handle rotatably carried by said shaft adjacent one end thereof for rotation about substantially the axis thereof, said handle having a clutching portion facing the opposite end of said shaft for receiving one end of a spacer member and clutching therewith upon rotation relative thereto in one direction, the opposite end of said shaft being of bulbous form.

2. A tool for inserting a spirally wound spacer member between spaced apart laminae of a structural member through an opening therethrough, which comprises an elongate shaft having an enlarged bulbous end portion, a handle rotatably carried by the opposite end of said shaft, said handle having a clutching portion facing said enlarged end of the shaft, said clutching portion being in the form of an internally threaded tubular extension of said handle and having an abutment face inwardly of said threads.

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